

What is claimed is:

1. A process for polymerizing olefins comprising contacting, in a reactor:
  - (a) ethylene and at least one comonomer selected from the group consisting of C4 to C8 alpha olefins; and
  - (b) a supported, treated catalyst system that comprises a first catalyst component, a second catalyst component, and at least one methylalumoxane-activatable compound.
2. The process of claim 1 wherein the supported, treated catalyst system has been produced by forming a supported bimetallic catalyst system comprising the first catalyst component and the second catalyst component, and contacting the supported bimetallic catalyst system with the at least one methylalumoxane-activatable compound.
3. The process of claim 1 wherein the second catalyst component is a metallocene catalyst compound.
4. The process of claim 1 wherein the polymerization process is a gas phase process.
5. The process of claim 1 wherein the polymerization process is a slurry process.
6. The process of claim 1 wherein the supported, treated catalyst system further comprises an activator and a carrier.
7. The process of claim 6 wherein the carrier is selected from the group consisting of: silica, alumina, silica-alumina, magnesium chloride, graphite, and mixtures thereof.
8. The process of claim 6 wherein the activator is selected from the group consisting of: a Lewis acid, an alkylaluminum compound, and an ionic activator.
9. The process of claim 8 wherein the Lewis acid is methylalumoxane.
10. The process of claim 8 wherein the alkylaluminum compound is trimethylaluminum.

11. The process of claim 1 wherein the first catalyst component comprises a first transition metal, and wherein the second catalyst component comprises a second transition metal.
12. The process of claim 11 wherein the at least one methylalumoxane-activatable compound comprises a transition metal that is the same as the first transition metal.
13. The process of claim 11 wherein the at least one methylalumoxane-activatable compound comprises a transition metal that is the same as the second transition metal.
14. The process of claim 11 wherein the at least one methylalumoxane-activatable compound comprises a transition metal that is different from both the first and second transition metals.
15. The process of claim 3 wherein the metallocene catalyst compound is represented by a formula selected from the group consisting of:

$Cp^A Cp^B MX_n$  ;

$Cp^A(A) Cp^B MX_n$  ;

$Cp^A(A) QMX_r$  ;

$Cp^A MQ_q X_w$  ;

$Cp^A M(W_2GZ) X_y$  ; and

$T(Cp^A M(W_2GZ) X_y)_m$

wherein M is a metal atom selected from the group consisting of: Group 3 to Group 12 metal atoms;

Cp is a ligand selected from the group consisting of: substituted or unsubstituted cyclopentadienyl ligands and ligands isolobal to cyclopentadienyl;

X is selected from the group consisting of: halogen ions, hydrides, C<sub>1</sub> to C<sub>12</sub> alkyls, C<sub>2</sub> to C<sub>12</sub> alkenyls, C<sub>6</sub> to C<sub>12</sub> aryls, C<sub>7</sub> to C<sub>20</sub> alkylaryls, C<sub>1</sub> to C<sub>12</sub> alkoxyis,

$C_6$  to  $C_{16}$  aryloxy,  $C_7$  to  $C_{18}$  alkylaryloxy,  $C_1$  to  $C_{12}$  fluoroalkyls,  $C_6$  to  $C_{12}$  fluoroaryl,  $C_1$  to  $C_{12}$  heteroatom-containing hydrocarbons and substituted derivatives thereof; amines, phosphines, ethers, carboxylates, dienes, and hydrocarbon radicals having from 1 to 20 carbon atoms;

(A) is a bridging group;

Q is a heteroatom-containing ligand;

T is a bridging group selected from the group consisting of  $C_1$  to  $C_{10}$  alkynes,  $C_6$  to  $C_{12}$  arylenes and  $C_1$  to  $C_{10}$  heteroatom containing groups, and  $C_6$  to  $C_{12}$  heterocyclic groups;

G is selected from the group consisting of carbon and silicon;

W is selected from the group consisting of  $-O-$ ;  $-NR-$ ;  $-CR_2-$  and  $-S-$ ;

R is selected from the group consisting of  $C_1$  to  $C_{10}$  heteroatom containing groups,  $C_1$  to  $C_{10}$  alkyls,  $C_6$  to  $C_{12}$  aryls,  $C_6$  to  $C_{12}$  alkylaryls,  $C_1$  to  $C_{10}$  alkoxy, and  $C_6$  to  $C_{12}$  aryloxy;

Z is selected from the group consisting of R,  $-OR$ ,  $-NR_2$ ,  $-CR_3$ ,  $-SR$ ,  $-SiR_3$ ,  $-PR_2$ , and hydride;

each X is chemically bonded to M;

each Cp group is chemically bonded to M;

m is an integer in the range of from 1 to 7;

n is 0 or an integer from 1 to 4;

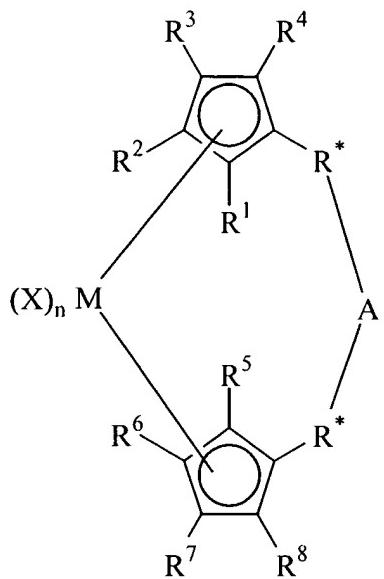
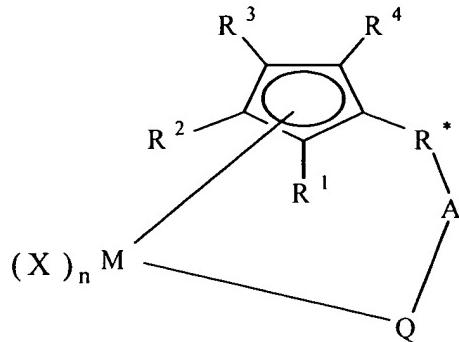
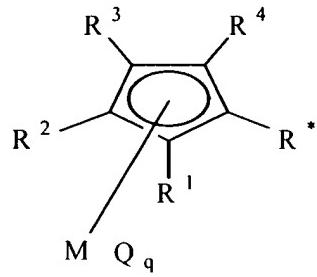
q is in the range of from 0 to 3;

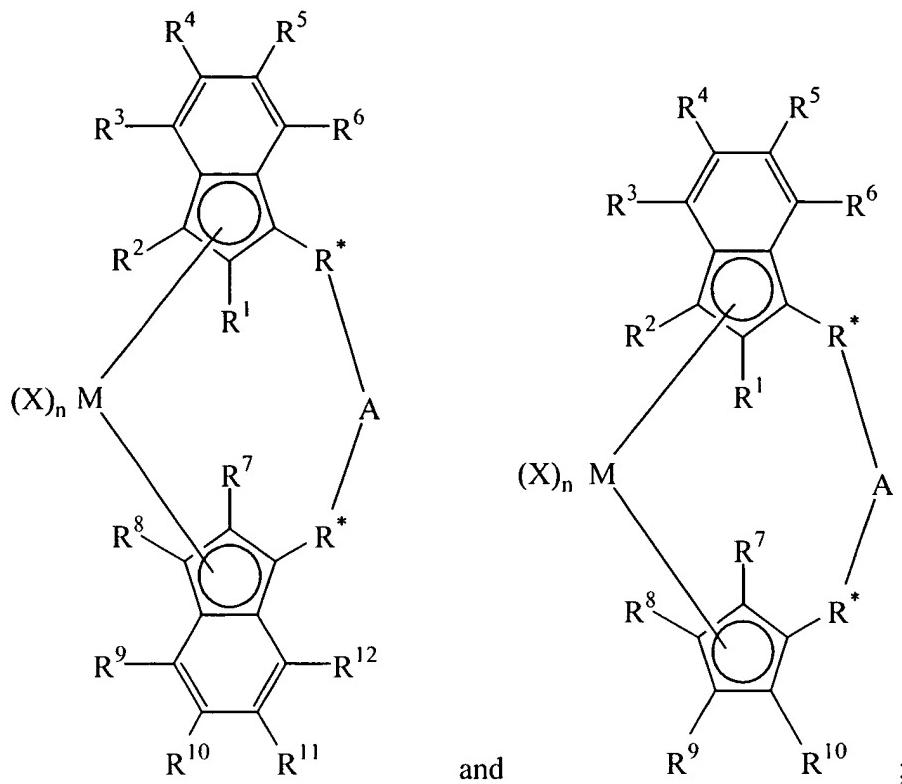
r is 0, 1 or 2;

w is in the range of from 0 to 3; and

y is 1 or 2.

16. The process of claim 3 wherein the metallocene catalyst compound is represented by a formula selected from the group consisting of:





wherein M is a metal atom selected from the group consisting of: Group 3 to Group 12 metal atoms;

Q in (Va-i) and (Va-ii) is selected from the group consisting of halogen ions, alkyls, alkylenes, aryls, arylene, alkoxys, aryloxy, amines, alkylamines, phosphines, alkylphosphines, substituted alkyls, substituted aryls, substituted alkoxy, substituted aryloxy, substituted amines, substituted alkylamines, substituted phosphines, substituted alkylphosphines, carbamates, heteroallyls, carboxylates, fluorinated alkyls, fluorinated aryls, and fluorinated alkylcarboxylates;

q is an integer ranging from 1 to 3;

each R\* is independently selected from the group consisting of hydrocarbyls and heteroatom-containing hydrocarbyls;

A is a bridging group;

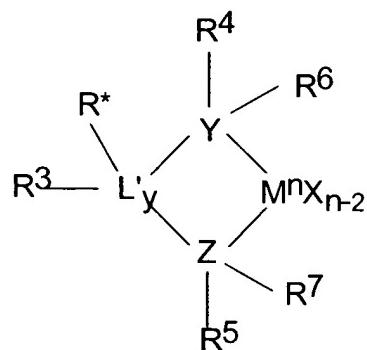
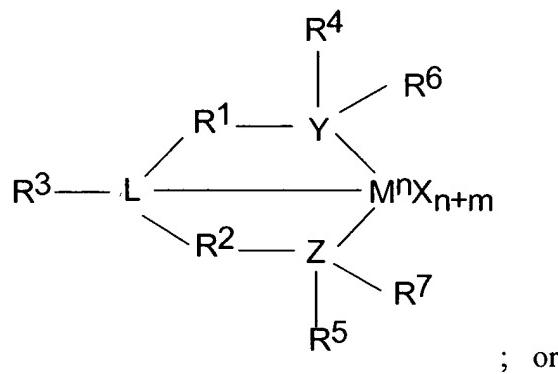
X is selected from the group consisting of: halogen ions, hydrides, C<sub>1</sub> to C<sub>12</sub> alkyls, C<sub>2</sub> to C<sub>12</sub> alkenyls, C<sub>6</sub> to C<sub>12</sub> aryls, C<sub>7</sub> to C<sub>20</sub> alkylaryls, C<sub>1</sub> to C<sub>12</sub> alkoxy, C<sub>6</sub> to C<sub>16</sub> aryloxy, C<sub>7</sub> to C<sub>18</sub> alkylaryloxy, C<sub>1</sub> to C<sub>12</sub> fluoroalkyls, C<sub>6</sub> to C<sub>12</sub> fluoroaryl, C<sub>1</sub> to C<sub>12</sub> heteroatom-containing hydrocarbons and substituted derivatives thereof; amines, phosphines, ethers, carboxylates, dienes, and hydrocarbon radicals having from 1 to 20 carbon atoms;

n is 0 or an integer from 1 to 4; and

R<sup>1</sup> through R<sup>12</sup> are independently: selected from the group consisting of hydrogen radical, halogen radicals, C<sub>1</sub> to C<sub>12</sub> alkyls, C<sub>2</sub> to C<sub>12</sub> alkenyls, C<sub>6</sub> to C<sub>12</sub> aryls, C<sub>7</sub> to C<sub>20</sub> alkylaryls, C<sub>1</sub> to C<sub>12</sub> alkoxy, C<sub>1</sub> to C<sub>12</sub> fluoroalkyls, C<sub>6</sub> to C<sub>12</sub> fluoroaryl, and C<sub>1</sub> to C<sub>12</sub> heteroatom-containing hydrocarbons and substituted derivatives thereof.

17. The process of claim 3 wherein the metallocene catalyst compound is selected from the group consisting of: bis(n-butylcyclopentadienyl)zirconium dichloride; bis(n-butylcyclopentadienyl)zirconium difluoride; (tetramethylcyclopentadienyl)(n-propylcyclopentadienyl)zirconium dichloride; (pentamethylcyclopentadienyl)(n-propylcyclopentadienyl)zirconium dichloride; bis(1,3-methylbutylcyclopentadienyl)zirconium dichloride; and bis(n-propylcyclopentadienyl)hafnium difluoride.
18. The process of claim 2 wherein the supported, treated catalyst system and the supported bimetallic catalyst system each have a transition metal concentration, and wherein the supported, treated catalyst system has a higher transition metal concentration than does the supported bimetallic catalyst system.
19. The process of claim 1 wherein the first catalyst component is a Ziegler-Natta catalyst.
20. The process of claim 19 wherein the Ziegler-Natta catalyst comprises a compound selected from the group consisting of Group 4 and Group 5 halides, oxides, oxyhalides, alkoxides, and mixtures thereof.

21. The process of claim 20 wherein the Ziegler-Natta catalyst is titanium tetrachloride.
22. The process of claim 1 wherein the at least one methylalumoxane-activatable compound is selected from the group consisting of: a metallocene catalyst compound; a Group-15-component-containing compound; a phenoxide catalyst compound; an additionally-discovered catalyst compound; or a conventional transition metal catalyst compound.
23. The process of claim 22 wherein the Group-15-component-containing compound is represented by a formula selected from the group consisting of:



wherein M is selected from the group consisting of: Group 3 to 12 transition metals and Group 13 to 14 main group metals;

each X is a leaving group;

y is 0 or 1;

n is the oxidation state of M and is selected from the group consisting of: +3, +4, and +5;

m is the formal charge of the YZL or the YZL' ligand and is selected from the group consisting of 0, -1, -2 and -3;

L is a Group 15 or 16 element;

L' is selected from the group consisting of: a Group 15 element, a Group 16 element, and a Group 14-containing group;

Y is a Group 15 element;

Z is a Group 15 element;

R<sup>1</sup> and R<sup>2</sup> are each selected from the group consisting of: a C<sub>1</sub> to C<sub>20</sub> hydrocarbon group, a heteroatom containing group having up to twenty carbon atoms, silicon, germanium, tin, lead, halogen and phosphorus;

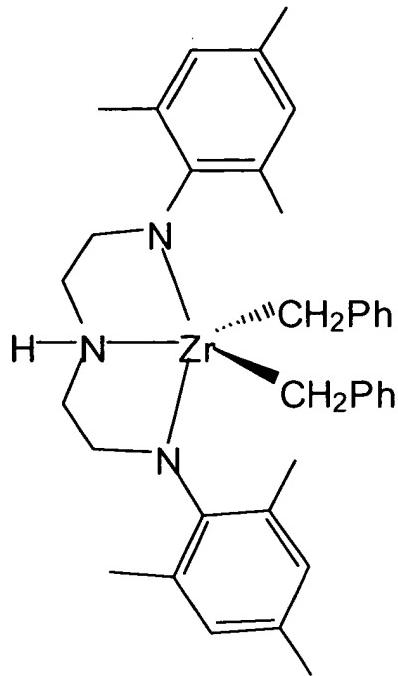
R<sup>3</sup> is absent or is selected from the group consisting of: a hydrocarbon group, hydrogen, a halogen, and a heteroatom containing group;

R<sup>4</sup> and R<sup>5</sup> are each selected from the group consisting of: an alkyl group, an aryl group, a substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, a cyclic aralkyl group, a substituted cyclic aralkyl group or multiple ring system having up to 20 carbon atoms, a C<sub>1</sub> to C<sub>20</sub> hydrocarbon group, a C<sub>1</sub> to C<sub>20</sub> aryl group, a C<sub>1</sub> to C<sub>20</sub> aralkyl group, and a heteroatom containing group.

R<sup>6</sup> and R<sup>7</sup> are each absent, or are selected from the group consisting of: hydrogen, an alkyl group, a halogen, a heteroatom or a hydrocarbyl group; and

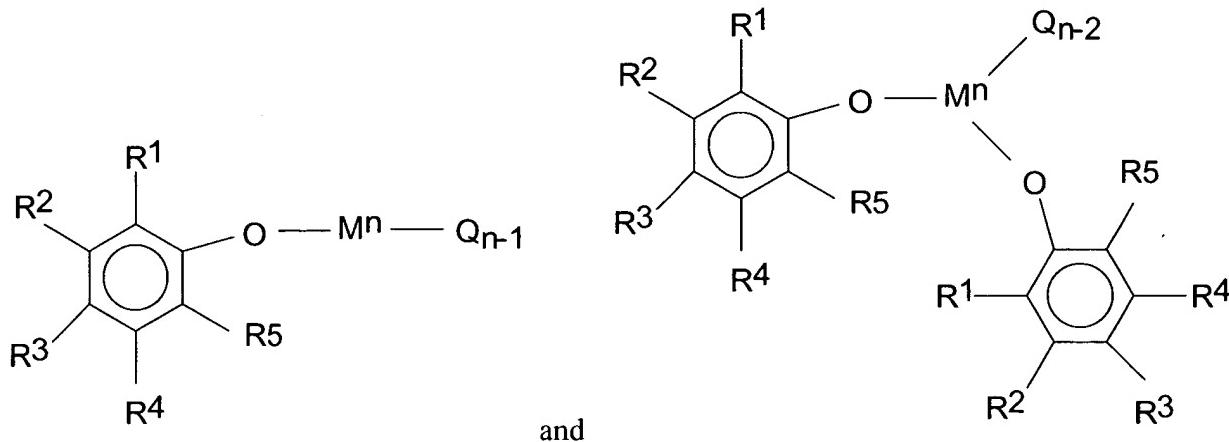
R\* is absent or is selected from the group consisting of: hydrogen, a Group 14 atom containing group, a halogen, and a heteroatom containing group.

24. The process of claim 23 wherein the Group-15-component-containing compound is



wherein Ph represents a phenyl group.

25. The process of claim 22 wherein the phenoxide catalyst compound is represented by a formula selected from the group consisting of:



wherein R<sup>1</sup> is selected from the group consisting of: hydrogen and a C<sub>4</sub> to C<sub>100</sub> group;

at least one of R<sup>2</sup> to R<sup>5</sup> is a heteroatom-containing group;

each of R<sup>2</sup> to R<sup>5</sup> that is not a heteroatom-containing group is selected from the group consisting of: hydrogen and a C<sub>1</sub> to C<sub>100</sub> group;

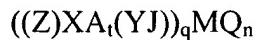
O is oxygen;

M is selected from the group consisting of: Group 3 to Group 10 transition metals and lanthanide metals;

n is the valence state of the metal M and is selected from the group consisting of 2, 3, 4, and 5; and

Q is an alkyl, halogen, benzyl, amide, carboxylate, carbamate, thiolate, hydride or alkoxide group.

26. The process of claim 22 wherein the additionally-discovered catalyst compound is selected from the group consisting of: complexes of nickel; complexes of nickel and palladium; diimine based ligands of Group 8 to 10 metal catalyst compounds; Group 5 and 6 metal imido complexes; bridged bi-aromatic ligand compounds; and compounds represented by the formula



where M is a metal selected from Group 3 to 13 or lanthanide and actinide series of the Periodic Table of Elements;

Q is bonded to M and each Q is a monovalent, bivalent, or trivalent anion;

X and Y are bonded to M; one or more of X and Y are heteroatoms,

Y is contained in a heterocyclic ring J, where J comprises from 2 to 50 non-hydrogen atoms,

Z is bonded to X, where Z comprises 1 to 50 non-hydrogen atoms;

t is 0 or 1;

A is a bridging group joined to at least one of X, Y or J;

q is 1 or 2;

n is an integer from 1 to 4.

27. The process of claim 22 wherein the conventional transition metal catalyst is selected from the group consisting of: a Ziegler-Natta catalyst; a vanadium catalyst; and a Phillips-type catalyst.
28. The process of claim 1 wherein the supported, treated catalyst system has a productivity of at least 4,500 grams polymer / gram catalyst hour.
29. The process of claim 1 wherein the supported, treated catalyst system has a productivity of at least 5,000 grams polymer / gram catalyst hour.
30. The process of claim 1 wherein the supported, treated catalyst system has a productivity of at least 6,000 grams polymer / gram catalyst hour.
31. The process of claim 1 wherein the supported, treated catalyst system has a productivity of at least 7,000 grams polymer / gram catalyst hour.
32. The process of claim 1 wherein the supported, treated catalyst system has a methylalumoxane efficiency of at least 1,100.
33. The process of claim 1 wherein the supported, treated catalyst system has a methylalumoxane efficiency of at least 2,000.
34. The process of claim 1 wherein an antistatic agent is present in the supported, treated catalyst system in an amount less than 2% by weight of the supported, treated catalyst system.
35. The process of claim 1 wherein the antistatic agent is present in the supported, treated catalyst system in an amount in the range of from 0% to 1% by weight of the supported, treated catalyst system.
36. The process of claim 2 wherein the supported, treated catalyst system and the supported bimetallic catalyst system each have a productivity, and wherein the productivity of the supported, treated catalyst system is greater than the productivity of the supported bimetallic catalyst system.

37. The process of claim 2 wherein the supported bimetallic catalyst system and the supported, treated catalyst system each have a methylalumoxane efficiency, and wherein the supported, treated catalyst system has a greater methylalumoxane efficiency than that of the supported bimetallic catalyst system.
38. A supported, treated catalyst system produced by a process comprising the steps of:
- (a) forming a supported bimetallic catalyst system comprising a first catalyst component and a second catalyst component; and
  - (b) contacting the supported bimetallic catalyst system of (a) with at least one methylalumoxane-activatable compound.
39. The supported, treated catalyst system of claim 38 wherein the supported bimetallic catalyst system further comprises an activator and a carrier.
40. The supported, treated catalyst system of claim 39 wherein the carrier is selected from the group consisting of silica, alumina, silica-alumina, magnesium chloride, graphite, and mixtures thereof.
41. The supported, treated catalyst system of claim 39 wherein the activator is selected from the group consisting of: a Lewis acid, an alkylaluminum compound, and an ionic activator.
42. The supported, treated catalyst system of claim 41 wherein the Lewis acid is methylalumoxane.
43. The supported, treated catalyst system of claim 41 wherein the alkylaluminum compound is trimethylaluminum.
44. The supported, treated catalyst system of claim 38 wherein the supported bimetallic catalyst system comprises a first and a second transition metal.
45. The supported, treated catalyst system of claim 44 wherein the at least one methylalumoxane-activatable compound comprises a transition metal that is the same as the first transition metal.

46. The supported, treated catalyst system of claim 44 wherein the at least one methylalumoxane-activatable compound comprises a transition metal that is the same as the second transition metal.
47. The supported, treated catalyst system of claim 44 wherein the at least one methylalumoxane-activatable compound comprises a transition metal that is different from both the first and second transition metals.
48. The supported, treated catalyst system of claim 38 wherein the second catalyst component comprises a metallocene catalyst compound.
49. The supported, treated catalyst system of claim 48 wherein the metallocene catalyst compound is represented by a formula selected from the group consisting of:

$Cp^A Cp^B MX_n$  ;

$Cp^A (A) Cp^B MX_n$  ;

$Cp^A (A) QMX_r$  ;

$Cp^A MQ_q X_w$  ;

$Cp^A M(W_2GZ)X_y$  ; and

$T(Cp^A M(W_2GZ)X_y)_m$

wherein M is a metal atom selected from the group consisting of: Group 3 to Group 12 metal atoms;

Cp is a ligand selected from the group consisting of: substituted or unsubstituted cyclopentadienyl ligands and ligands isolobal to cyclopentadienyl;

X is selected from the group consisting of: halogen ions, hydrides, C<sub>1</sub> to C<sub>12</sub> alkyls, C<sub>2</sub> to C<sub>12</sub> alkenyls, C<sub>6</sub> to C<sub>12</sub> aryls, C<sub>7</sub> to C<sub>20</sub> alkylaryls, C<sub>1</sub> to C<sub>12</sub> alkoxy, C<sub>6</sub> to C<sub>16</sub> aryloxy, C<sub>7</sub> to C<sub>18</sub> alkylaryloxy, C<sub>1</sub> to C<sub>12</sub> fluoroalkyls, C<sub>6</sub> to C<sub>12</sub> fluoroaryls, C<sub>1</sub> to C<sub>12</sub> heteroatom-containing hydrocarbons and substituted

derivatives thereof; amines, phosphines, ethers, carboxylates, dienes, and hydrocarbon radicals having from 1 to 20 carbon atoms;

(A) is a bridging group;

Q is a heteroatom-containing ligand;

T is a bridging group selected from the group consisting of C<sub>1</sub> to C<sub>10</sub> alkynes, C<sub>6</sub> to C<sub>12</sub> arynes and C<sub>1</sub> to C<sub>10</sub> heteroatom containing groups, and C<sub>6</sub> to C<sub>12</sub> heterocyclic groups;

G is selected from the group consisting of carbon and silicon;

W is selected from the group consisting of -O-; -NR-; -CR<sub>2</sub>- and -S-;

R is selected from the group consisting of C<sub>1</sub> to C<sub>10</sub> heteroatom containing groups, C<sub>1</sub> to C<sub>10</sub> alkyls, C<sub>6</sub> to C<sub>12</sub> aryls, C<sub>6</sub> to C<sub>12</sub> alkylaryls, C<sub>1</sub> to C<sub>10</sub> alkoxyis, and C<sub>6</sub> to C<sub>12</sub> aryloxyis;

Z is selected from the group consisting of R, -OR, -NR<sub>2</sub>, -CR<sub>3</sub>, -SR, -SiR<sub>3</sub>, -PR<sub>2</sub>, and hydride;

each X is chemically bonded to M;

each Cp group is chemically bonded to M;

m is an integer in the range of from 1 to 7;

n is 0 or an integer from 1 to 4;

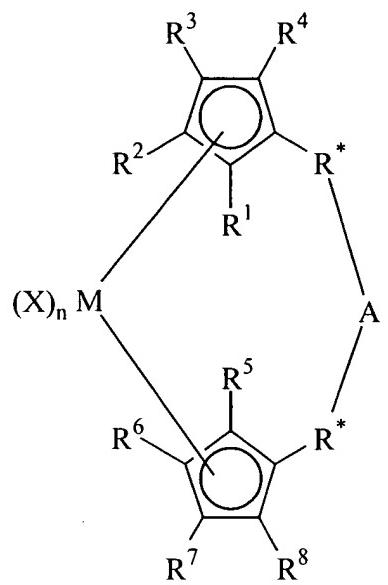
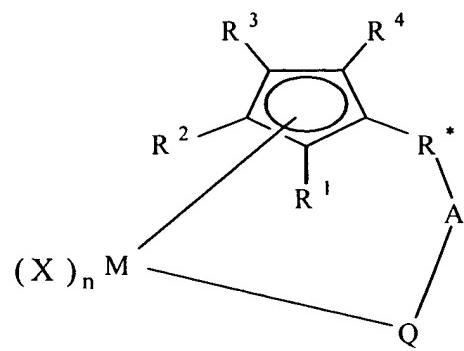
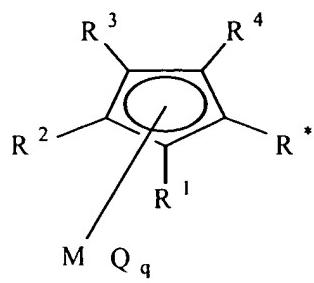
q is in the range of from 0 to 3;

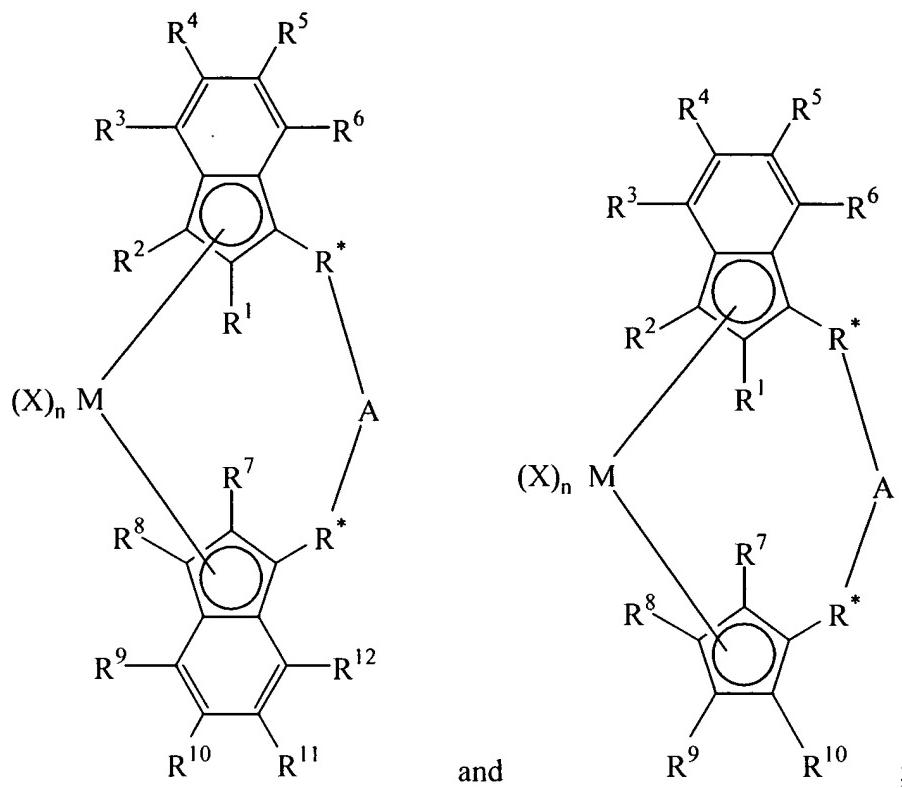
r is 0, 1 or 2;

w is in the range of from 0 to 3; and

y is 1 or 2.

50. The supported, treated catalyst system of claim 48 wherein the metallocene catalyst compound is represented by a formula selected from the group consisting of:





wherein M is a metal atom selected from the group consisting of: Group 3 to Group 12 metal atoms;

Q in (Va-i) and (Va-ii) is selected from the group consisting of halogen ions, alkyls, alkylenes, aryls, arylene, alkoxy, aryloxy, amines, alkylamines, phosphines, alkylphosphines, substituted alkyls, substituted aryls, substituted alkoxy, substituted aryloxy, substituted amines, substituted alkylamines, substituted phosphines, substituted alkylphosphines, carbamates, heteroallyls, carboxylates, fluorinated alkyls, fluorinated aryls, and fluorinated alkylcarboxylates;

q is an integer ranging from 1 to 3;

each R\* is independently selected from the group consisting of hydrocarbyls and heteroatom-containing hydrocarbyls;

A is a bridging group;

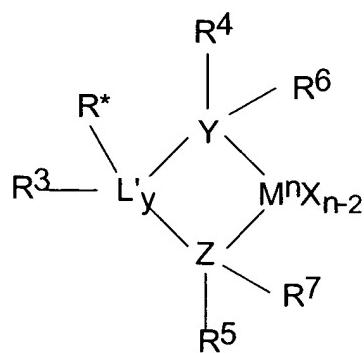
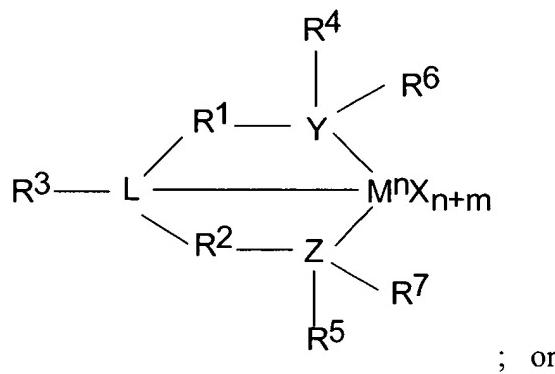
X is selected from the group consisting of: halogen ions, hydrides, C<sub>1</sub> to C<sub>12</sub> alkyls, C<sub>2</sub> to C<sub>12</sub> alkenyls, C<sub>6</sub> to C<sub>12</sub> aryls, C<sub>7</sub> to C<sub>20</sub> alkylaryls, C<sub>1</sub> to C<sub>12</sub> alkoxy, C<sub>6</sub> to C<sub>16</sub> aryloxy, C<sub>7</sub> to C<sub>18</sub> alkylaryloxy, C<sub>1</sub> to C<sub>12</sub> fluoroalkyls, C<sub>6</sub> to C<sub>12</sub> fluoroaryl, C<sub>1</sub> to C<sub>12</sub> heteroatom-containing hydrocarbons and substituted derivatives thereof; amines, phosphines, ethers, carboxylates, dienes, and hydrocarbon radicals having from 1 to 20 carbon atoms;

n is 0 or an integer from 1 to 4; and

R<sup>1</sup> through R<sup>12</sup> are independently: selected from the group consisting of hydrogen radical, halogen radicals, C<sub>1</sub> to C<sub>12</sub> alkyls, C<sub>2</sub> to C<sub>12</sub> alkenyls, C<sub>6</sub> to C<sub>12</sub> aryls, C<sub>7</sub> to C<sub>20</sub> alkylaryls, C<sub>1</sub> to C<sub>12</sub> alkoxy, C<sub>1</sub> to C<sub>12</sub> fluoroalkyls, C<sub>6</sub> to C<sub>12</sub> fluoroaryl, and C<sub>1</sub> to C<sub>12</sub> heteroatom-containing hydrocarbons and substituted derivatives thereof.

51. The supported, treated catalyst system of claim 48 wherein the metallocene catalyst compound is selected from the group consisting of: bis(n-butylcyclopentadienyl)zirconium dichloride; bis(n-butylcyclopentadienyl)zirconium difluoride; (tetramethylcyclopentadienyl) (n-propylcyclopentadienyl)zirconium dichloride; (pentamethylcyclopentadienyl) (n-propylcyclopentadienyl)zirconium dichloride; bis(1,3-methylbutylcyclopentadienyl)zirconium dichloride; and bis(n-propylcyclopentadienyl)hafnium difluoride.
52. The supported, treated catalyst system of claim 38 wherein the supported, treated catalyst system and the supported bimetallic catalyst system each have a transition metal concentration, and wherein the supported, treated catalyst system has a higher transition metal concentration than does the supported bimetallic catalyst system.
53. The supported, treated catalyst system of claim 38 wherein the first catalyst component is a Ziegler-Natta catalyst.

54. The supported, treated catalyst system of claim 53 wherein the Ziegler-Natta catalyst comprises a compound selected from the group consisting of Group 4 and Group 5 halides, oxides, oxyhalides, alkoxides, and mixtures thereof.
55. The supported, treated catalyst system of claim 54 wherein the Ziegler-Natta catalyst is titanium tetrachloride.
56. The supported, treated catalyst system of claim 38 wherein the at least one methylalumoxane-activatable compound is selected from the group consisting of: a metallocene catalyst compound; a Group-15-component-containing compound; a phenoxide catalyst compound; an additionally-discovered catalyst compound; or a conventional transition metal catalyst compound.
57. The supported, treated catalyst system of claim 56 wherein the Group-15-component-containing compound is represented by a formula selected from the group consisting of:



wherein M is selected from the group consisting of: Group 3 to 12 transition metals and Group 13 to 14 main group metals;

each X is a leaving group;

y is 0 or 1;

n is the oxidation state of M and is selected from the group consisting of: +3, +4, and +5;

m is the formal charge of the YZL or the YZL' ligand and is selected from the group consisting of 0, -1, -2 and -3;

L is a Group 15 or 16 element;

L' is selected from the group consisting of: a Group 15 element, a Group 16 element, and a Group 14-containing group;

Y is a Group 15 element;

Z is a Group 15 element;

R<sup>1</sup> and R<sup>2</sup> are each selected from the group consisting of: a C<sub>1</sub> to C<sub>20</sub> hydrocarbon group, a heteroatom containing group having up to twenty carbon atoms, silicon, germanium, tin, lead, halogen and phosphorus;

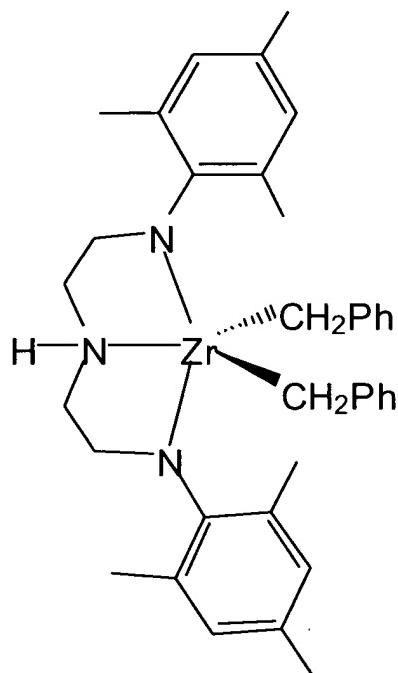
R<sup>3</sup> is absent or is selected from the group consisting of: a hydrocarbon group, hydrogen, a halogen, and a heteroatom containing group;

R<sup>4</sup> and R<sup>5</sup> are each selected from the group consisting of: an alkyl group, an aryl group, a substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, a cyclic aralkyl group, a substituted cyclic aralkyl group or multiple ring system having up to 20 carbon atoms, a C<sub>1</sub> to C<sub>20</sub> hydrocarbon group, a C<sub>1</sub> to C<sub>20</sub> aryl group, a C<sub>1</sub> to C<sub>20</sub> aralkyl group, and a heteroatom containing group.

$R^6$  and  $R^7$  are each absent, or are selected from the group consisting of: hydrogen, an alkyl group, a halogen, a heteroatom or a hydrocarbyl group; and

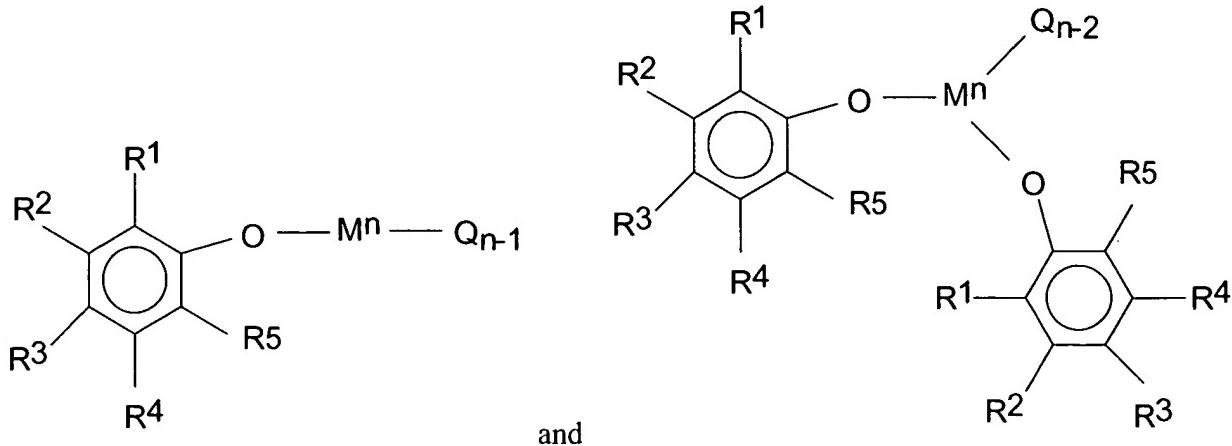
$R^*$  is absent or is selected from the group consisting of: hydrogen, a Group 14 atom containing group, a halogen, and a heteroatom containing group.

58. The supported, treated catalyst system of claim 57 wherein the Group-15-component-containing compound is



wherein Ph represents a phenyl group.

59. The supported, treated catalyst system of claim 56 wherein the phenoxide catalyst compound is represented by a formula selected from the group consisting of:



wherein R<sup>1</sup> is selected from the group consisting of: hydrogen and a C<sub>4</sub> to C<sub>100</sub> group;

at least one of R<sup>2</sup> to R<sup>5</sup> is a heteroatom-containing group;

each of R<sup>2</sup> to R<sup>5</sup> that is not a heteroatom-containing group is selected from the group consisting of: hydrogen and a C<sub>1</sub> to C<sub>100</sub> group;

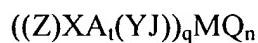
O is oxygen;

M is selected from the group consisting of: Group 3 to Group 10 transition metals and lanthanide metals;

n is the valence state of the metal M and is selected from the group consisting of 2, 3, 4, and 5; and

Q is an alkyl, halogen, benzyl, amide, carboxylate, carbamate, thiolate, hydride or alkoxide group.

60. The supported, treated catalyst system of claim 56 wherein the additionally-discovered catalyst compound is selected from the group consisting of: complexes of nickel; complexes of nickel and palladium; diimine based ligands of Group 8 to 10 metal catalyst compounds; Group 5 and 6 metal imido complexes; bridged bi-aromatic ligand compounds; and compounds represented by the formula



where M is a metal selected from Group 3 to 13 or lanthanide and actinide series of the Periodic Table of Elements;

Q is bonded to M and each Q is a monovalent, bivalent, or trivalent anion;

X and Y are bonded to M; one or more of X and Y are heteroatoms,

Y is contained in a heterocyclic ring J, where J comprises from 2 to 50 non-hydrogen atoms,

Z is bonded to X, where Z comprises 1 to 50 non-hydrogen atoms;

t is 0 or 1;

A is a bridging group joined to at least one of X, Y or J;

q is 1 or 2;

n is an integer from 1 to 4.

61. The supported, treated catalyst system of claim 56 wherein the conventional transition metal catalyst is selected from the group consisting of: a Ziegler-Natta catalyst; a vanadium catalyst; and a Phillips-type catalyst.
62. The supported, treated catalyst system of claim 38 wherein an antistatic agent is present in an amount less than 2% by weight of the supported, treated catalyst system.
63. The supported, treated catalyst system of claim 38 wherein the antistatic agent is present in an amount in the range of from 0% to 1% by weight of the supported, treated catalyst system.